Sustainable Malaria Education (3):

School Based Malaria Intervention in East Lombok (SBMI EL)

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〔抄　録〕

2005 年にマラリア・アウトブレイクが発生したインドネシア西ヌサテンガラ州の東ロンボク島では，今年もマラリア感染者数は減少傾向にある。本国際共同研究「マラリア・コントロール・プログラム」では，2012 年度よりマラリア制圧戦略として，「小学校を基盤とする持続可能なマラリア教育メソッド（Mataram University Method for Sustainable Malaria Education: MUM/SME）」の開発を決定した。まず，2013 年 1–2 月に予備調査を実施し（『社会学部論集』第 56 号，第 57 号参照），同年 6–8 月に小学生 800 名を対象とする同教育メソッドの本格的な実践をスタートした。小学生がマラリアの医学知識を自主学習できる教育メソッドを開発し，かれらが“ヘルスメッセンジャー”として学校や家庭，コミュニティにおいて，マラリア予防のために活躍できることを目標とする。

この「持続可能なマラリア教育メソッド」の効果を検証した結果，同教育メソッドの実践によって，①マラリア全般知識水準に統計的有意な向上が見られた。②マラリア知識についての 8 基本項目すべてにおいて顕著な向上が見られた。③同教育メソッド全般について，参加した生徒の大多数（86%）から「興味深い」「理解しやすい」という回答を得た。④とくに，同教育メソッドで導入された〈マラリアコミック〉〈マラリアの語り部〉〈マラリアに関するゲーム〉について，参加した 95 パーセントの生徒から高い評価を得た。なかでも〈マラリアコミック〉が一番人気であった（55%）。東ロンボックの農村地域では，娯楽がほとんどなく，〈コミック〉の導入は，小学生のマラリア知識の向上に非常に有効であった。今後は，小学生がマラリア撲滅のために“ヘルスメッセンジャー”として，学校や家庭，地域社会で活躍できる「マラリア見守り隊（Malaria School Scout）」の創設に取り組む。

キーワード　Malaria education, Health messenger, Malaria school intervention, Epidemiological survey, Malaria School Scout（MASCOT）

1. Introduction

1.1 Background

A study on Malaria Control Program in Lombok, Indonesia has been carried out since 2007 as a collaborative study between Bukkyo University and Medical Faculty of Mataram University. The study was launched in response to the malaria outbreak in East Lombok in 2005, namely, *Collecting Baseline Data and Epidemiological/Sociological Survey (CBDESSS) phase I and phase II*[(1)].

The CBDESS phase I focused on assessing the socio-epidemiological aspects of malaria in the community of East Lombok, particularly the 4 villages, Tanjung Luar, Sukaraja, Batunampar and Pijot. As many as 992 respondents took part in the CBDESS phase I and 3038 volunteered in the Malaria Active Case Detection Study. CBDESS phase II was a comparative cross sectional study, to explore specific community characteristics between the coastal region (Pemongkong and Bungin village) and hill region (Perigi and Sepit), which are previously known as malaria endemic area. A total of the 1019 respondents took part in CBDESS phase II.

Over the past few years, malaria incidence in East Lombok, particularly in Pijot, Tanjung Luar, Batunampar and Sukaraja has significantly decreased. However, there are still concerns in maintaining the achieved low incidence of malaria. Therefore, the comprehensive local involvement is highly required to achieve successful malaria eradication program. The previous CBDESS phase I and phase II target productive age respondents, however, the following study on Malaria Control Program in Lombok would focus on school age children.

School children have been increasingly recognized as a significant component in the society to play a key role in malaria control program. Several studies have shown improvement of knowledge and behavior on malaria through a school based intervention[(2)–(4)]. There are various approaches in school based intervention. According to Okabayashi et al, a successful school based intervention involves: good teaching materials and integrating malaria subject in school curriculum (lectures and student project)[(3)].

Thus, in 2012, an Epidemiology Survey on Malaria Knowledge and Behavior Among Elementary School Children in East Lombok (ESMKB AESCEL) was carried out. The study sites were 8 elementary schools in the south part of east Lombok, mainly in the village of Batunampar, Pijot, Tanjung Luar and Sukaraja. This was a preliminary study to determine the community characteristics, knowledge and behavior on malaria among elementary school children in East Lombok. As many as 398 students aged 10–13 participated in the study. According to this study, approximately 69.3% students have

poor knowledge on malaria and 39.1% did not use any form of anti-mosquito prevention during outdoor activity at night. Being left without any form of intervention could be a threat to the already achieved low incidence case of malaria in the 4 villages(5).

Although the majority of East Lombok has been categorized as low malaria endemic area in 2011, Belanting and Obel-Obel villages still remain as high endemic area. The Annual Parasite Index (API) for malaria in Belanting in 2011 is 7.29, which is the highest in East Lombok. There were 1377 malaria cases reported in the local Public Health Center, with 82 confirmed positive cases through blood smear and/or rapid diagnostic test. The mostly infected age group is 15 years old or above (51 out of 82 positive cases). Out of the 82 positive cases, the majority had mixed infection of *Plasmodium falciparum and Plasmodium vivax* (59.7%)(6). In response to this, Belanting and Obel Obel were also included for a school based malaria intervention in this study.

Based on the above results, a study on school based malaria intervention was conducted placing originally designed comic as the main medium and the tool of intervention. There are two main study sites: First sites, which will be addressed as the Part I study, were previous 8 elementary schools from ESMKB AESCL study, situated in the 4 villages located in the south part of east Lombok: Pijot, Batunampar, Sukaraja and Tanjung Luar. The second study sites, which will be addressed as the Part II study, are 8 elementary schools, situated in the north part of East Lombok, specifically in Belanting and Obel-Obel Village.

1.2 Objectives

There are several objectives of this study of part I and part II.

The study Part I focuses on the study sites in Tanjung Luar, Pijot, Batunampar and Sukarja. Upon receiving the baseline data collected from the previous ESMKB AESCEL, the objectives in the Part I of this study are followings:

- To determine the level of malaria knowledge before and after intervention among elementary school children in the south part of East Lombok: Batunampar, Pijot, Tanjung Luar and Sukaraja
- To seek significant value of each knowledge construct and overall malaria knowledge among elementary school children in the south part of East Lombok: Batunampar, Pijot, Tanjung Luar and Sukaraja
- To seek the preferred method of knowledge transfer among elementary school children in the south part of East Lombok: Batunampar, Pijot, Tanjung Luar and Sukaraja

The study Part II focuses on the study sites in Belanting and Obel Obel. As the previous ESMKB AESCEL has not yet covered these areas, therefore the objectives in the Part I of this study are:

- To identify elementary school children characteristics in Belanting and Obel-Obel
- To identify family characteristics in Belanting and Obel-Obel
- To identify susceptible behaviors and anti-mosquito utilization related to malaria transmission among children in Belanting and Obel-Obel
- To identify utilization of anti-mosquito measures and products in the household Belanting and Obel-Obel
- To determine the level of malaria knowledge before and after intervention among elementary school children in Belanting and Obel-Obel
- To seek significant value of each knowledge construct and overall malaria knowledge among elementary school children in Belanting and Obel-Obel
- To seek the preferred method of knowledge transfer among elementary school children in Belanting and Obel-Obel

1.3 Methods

1.3.1 Study Area

There are two major study areas in this study. The first study sites are villages that were the same villages included in the previous baseline study *Epidemiology survey on malaria knowledge and behavior among elementary school children in East Lombok (ESMKB AESCEL)*, namely, Batunampar, Pijot, Sukaraja and Tanjung Luar. According to the data shown in the last three years (2010–2012), these villages have relatively lower API (The Annual Parasitic Index). In 2010, the API for Keruak is 0.36%, Sukaraja 1.06% and Jerowaru 0.26%. In 2011, the API for Keruak is 0.25%, Sukaraja 0.25% and Jerowaru 0.11%. In 2006, the API number continues to decline in Keruak 0.06%, Sukaraja 0.19% and Jerowaru 0.05%[(6)].

Whereas, the second study sites are villages in the south part of east Lombok that have been identified with high API level. The villages included in this study, namely, Belanting and Obel-Obel were previously categorized as high and moderate malaria endemic villages in East Lombok since 2007 till 2010. Both villages are located in Sambelia sub-district. Over the last few years, the number of malaria incidence has declined in these 2 villages. The APIin Belanting in 2012 is 4.27%, declining from 15.92% in 2010 and 6.76% in 2011, 0.11, and the API of Obel-Obel in 2012 (under the Sambelia sub-district API) is 0.93%, declining from 5.63% in 2010 and 2.01% in 2011[(6)]. Both study sitesare shown in Figure 1.1.

East Lombok covers a total area of approximately 2,678.88 km^2, comprising 1,605.5 km^2 (59.91%) mainland and 1,074.33 km^2 (40.09%) sea area. Land area of East Lombok covers 33.88% of the total land area in Lombok or 7.97 percent of the land area of West Nusa Tenggara Province. In 2011, approximately 45,813 ha (28.53%) is the wetland while 114,747 ha (71,475) is the dry land. East Lombok located at an altitude of 0 –

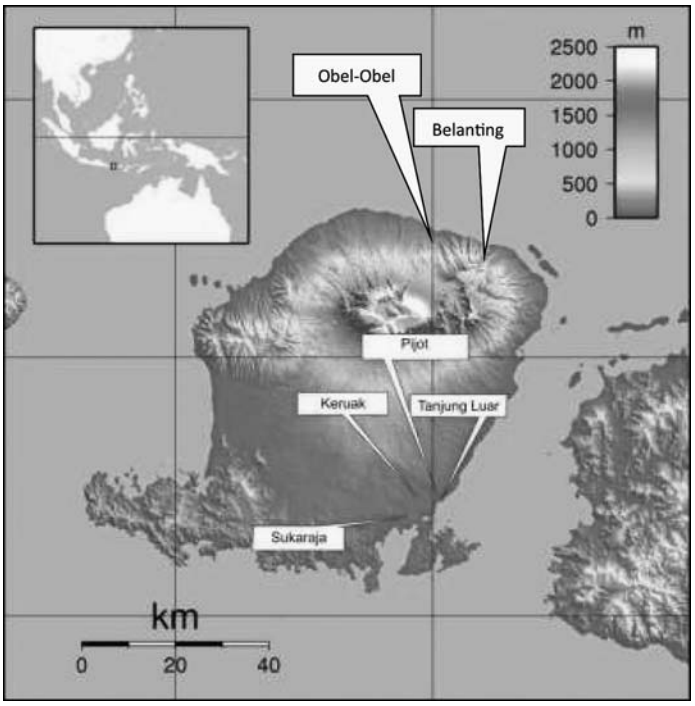


Figure 1.1　Map showing selected locations in this study

3,726 feet above sea level with slopes stretching from north to south. East Lombok has a tropical climate with temperature 20°–33°C, monthly rainfall of 1.528 mm and average days of rain as 8 days per month. Sambelia Sub-district covers area approximately 245.22 km^2 (15.27% of East Lombok) with altitude of 131 meters above sea level(7).

The population of East Lombok is 1,116,745 in 2011, which has increased 1.01% compared to 2010. Keruak sub-district is categorized as medium density (1000–2000 inhabitants per km^2), while Jerowaru is classified as low density (＜1000 inhabitants per km^2). Pijot village is approximately 6.8 km^2 with 6609 inhabitants. Tanjung Luar village is a smaller village, approximately 2.36 km^2 with 12.638 inhabitants. Batunampar village is approximately 9.24 km^2 with 5007 inhabitants, while Sukaraja is 14.38 km^2 with 11.517 inhabitants. Sambelia sub-district is categorized as low density (＜1000 inhabitants per km^2). Belanting village has approximately 5,067 inhabitants and Obel-Obel village has approximately 1,927 inhabitants(7)–(9).

1.3.2 Target Population

For the study Part I, a total of 8 schools were selected with 2 schools in each village. The selected schools were the same as schools selected for the previous baseline study through ESMKB AESCEL, conducted in 2012. School children selected for this study were randomly selected from grade 5–6. The table below shows the selected schools in

this study.

Part II Study

In total, there are 20 elementary schools located in Sambelia sub-district, with 5 elementary schools in Belanting village and 3 elementary schools in Obel-Obel village. The average numbers of students attending each school in Belanting are 200 students. In Obel-Obel village, there are 3 elementary schools in total and the average numbers of students attending each school are 154 students[3]. For this study, a total of 4 elementary schools was selected with 2 schools in each village. We included grade 5–6 students in the selected schools as subjects of this study, as shown in Table 1.2.

The schools selected in this study had an average of 209 school children attending each school. There were 12–15 teachers on average in each school. The majority of school had a School Health Unit, a national program. However, due to the lack of resources, the School Health Unit is in active currently. As a part of the sport and health education subject, there are some forms of health education integrated in the school curriculum. The main health topic taught in schools is general hygiene. Physical education teachers along with the staff from the community health center (*Puskesmas*) teach this subject.

Table 1.1 Selected schools for Study Part I. Study Sites comprising elementary schools in East Lombok

Village	Elementary schools	Total of selected students
Tanjung Luar	SD 1 Tanjung Luar	50
	SD 4 Tanjung Luar	56
Batunampar	SD 2 Batunampar	55
	SD 3 Batunampar	45
Sukaraja	SD 2 Sukaraja	55
	SD 4 Sukaraja	50
Pijot	SD 2 Pijot	49
	SD 3 Pijot	50
TOTAL		410

Table 1.2 Selected schools for Study Part II. Study Sites comprising elementary schools in the north part of East Lombok

Village	Elementary school	Total Selected students
Belanting	SDN 1 Belanting	50
	SDN 4 Belanting	45
	SDN 2 Belanting	50
	SDN 3 Belanting	50
	SDN 5 Belanting	48
Obel-Obel	SDN 1 Obel-Obel	50
	SDN 2 Obel-Obel	50
	SDN 3 Obel-Obel	42
TOTAL		385

The staff in the *Puskesmas* is responsible for promoting health education to elementary school children by mainly organizing monthly visits to each school, however, due to the lack of human resources, the continuity and sustainability of the School Health Unit programs are not always maintained. Moreover, there is no particular form of malaria education integrated in the curriculum.

1.3.3 Study Design

The study was a community based cross-sectional survey conducted in the period of January 2013 through August 2013 in 16 elementary schools, consisting of 8 in the south part of East Lombok (Batunampar, Sukaraja, Pijot and Tanjung Luar Village) and 8 in the north part of East Lombok (Belanting and Obel-Obel village). There are several aspects covered in this study as follows:

1) Collecting baseline data

Collecting baseline data was primarily conducted on elementary school children in the north part of East Lombok (Belanting and Obel-Obel Village). As for the south part of East Lombok, baseline data has been performed through the ESMKB AESCEL study in East Lombok in 2012.

The data collected in the baseline survey was based on the same components as the ESMKB AESCEL study in 2012: respondents' characteristics, family characteristics, malaria knowledge, susceptible behaviors and utilization of anti-mosquito products among respondents, utilization of anti-mosquito products in the household, and malaria experience among respondents and the family members.

Respondents' characteristics include age, sex, religion and ethnicity. The family characteristics include the number of siblings, parent's occupational and educational status. These baseline data would provide basic information on the socioeconomic background of school children and the family members.

The susceptible behaviors associated with malaria among respondents and the family members were also identified by the question items: frequent outdoor activities at night and anti-mosquito measures. Furthermore, respondents were also asked about their behavior associated with malaria in the household: utilization of anti-mosquito products, the family members responsible for the preparation of anti-mosquito products. Finally, previous malaria experience of respondents and family members were also observed.

2) Intervention Study

The main aim of this study is to determine the level of malaria knowledge before and after intervention among elementary school children in East Lombok. We performed a before-after intervention study. A pre-test on malaria knowledge was conducted. This was then followed by an intervention method, which comprises reading malaria comic by students themselves, storytelling and games. Firstly, malaria comic was distributed to each student, and the students read the comic for 10–15 minutes individually. The story

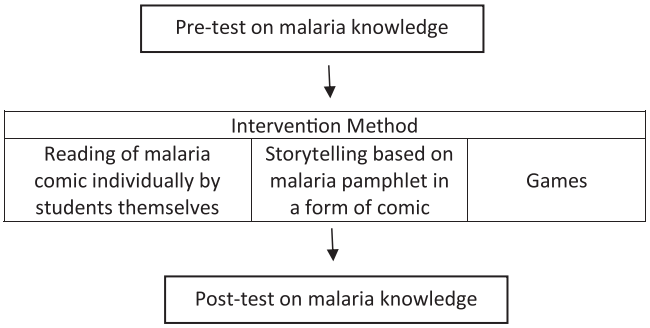


Figure 1.2　Intervention methods

telling was based on the malaria pamphlet in a form of comic designed by the researchers. Then a game session was done in a form of individual quiz to recall the students' understanding of malaria. Finally, a post-test was conducted using the same questionnaire items in the pre-test. The scheme of the intervention is shown in Figure 1.2.

Quantitative techniques were used for the pre- and post-test. Pre-test and post-test was conducted through a guided interview modified from the ESMKB AESCEL study in 2012. As many as 8 questions were derived from ESMKB AESCEL and the information presented in the pamphlet that was distributed to the children. The simplified questionnaire represents knowledge on malaria symptoms, transmission, prevention and treatment.

The variables of malaria knowledge were determined by 4 constructs i.e., malaria symptom (question 1 and 2), malaria transmission (question 3–5), malaria prevention (question 6–7), malaria treatment (question 8). Therefore, there were 8 questions on malaria knowledge in the questionnaire in total.

The first construct of malaria was malaria symptom. This aspect comprises two questions. First, respondents were asked if they knew any malaria symptom (score 1: knowing 3 or more symptoms correctly; score 0: knowing less than 3 malaria symptoms). Second, respondents were asked if they take malaria as a dangerous disease (score 1: knowing that malaria is a dangerous disease; score 0: all other answers).

The second construct of the questionnaire was malaria transmission. This aspect comprises 3 questions. The first question was whether students knew that malaria was a transmissible disease (score 1: knowing that malaria is a transmissible disease, score 0: do not know). The second question was whether students could identify the vector for malaria (score 1: being able to identify the mosquito as a vector; score 0: all other answers). Finally, students were asked the cause of malaria (score 1: Plasmodium; score 0: all other answers).

The third construct was malaria prevention. There were 2 questions asked to students

regarding this aspect. Firstly, the students were asked if they knew the vector breeding site of malaria (score 1: stagnant water; score 0: all other answers). Secondly, students were asked if they knew any preventive measures for malaria (1: being able to identify at least 2 preventive measures correctly; 0: being able to identify 1 preventive measure or none).

The final construct was malaria treatment. Students were asked if they were able to identify the therapy for malaria (score 1: medication from the doctor/puskesmas/hospital; score 0: all other answers or do not know). The overall level of malaria knowledge was scaled and divided into 3 categories, i.e. "good" (having 6–8 correct answers), "moderate" (having 4–5 correct answers) and "low" (having 0–3 correct answers).

Finally, a survey on students' feedback on the intervention method was conducted. The aspect that was considered in the survey was 1) Was the intervention method interesting?, 2) Was the comic informative? and 3) Which intervention method was most interesting (comic, storytelling or games)?.

3) Data Analysis

Statistical analysis was conducted based on the data entered in the computer using SPSS (version 17.0) comparing the proportion on each knowledge aspect between the groups before and after intervention formed by cross-tabulation using McNemar test. A p-value less than 0.05 were considered significant.

2. Results

2.1 The Study Part I: Tanjung Luar, Pijot, Sukaraja and Batunampar Villages

2.1.1 Respondents Characteristics

A total of 410 elementary school children (5–6 grade) from the 4 villages in East Lombok participated as respondents in this study, including 105 (25.61%) from Sukaraja, 99 (24.15%) from Pijot, 100 (24.39%) from Batunampar and 106 (25.85%) from Tanjung Luar. In general, the age ratio ranged from 9 to 13 years old with the majority age of 12 (43.17%). The major religion and ethnic group are Islam (100%) and Sasak (97.32%) respectively. Comprehensive descriptions of respondents' characteristics are presented in Table 2.1.

2.1.2 Overall malaria knowledge before and after intervention

As many as 410 students (grade 4, 5, 6) participated in this study. A pre- and post-test was conducted to determine the level of malaria knowledge. As shown in Figure 2.1, there was an increase of malaria knowledge level after the intervention. Before the intervention, students having good malaria knowledge were 17 (4.15%), while it became 210 (51.2%) after intervention. Comparison analysis of overall level of knowledge between groups before and after intervention showed significant differences ($p < 0.001$).

Table 2.1 Respondents' characteristics in Tanjung Luar, Batunampar, Pijot and Sukaraja

Characteristics	N = 410 (%)
Age	
9	22 (5.37)
10	73 (17.80)
11	94 (22.93)
12	165 (40.24)
13	56 (13.66)
Sex	
Male	203 (49.51)
Female	207 (50.49)
Religion	
Islam	410 (100)
Ethnicity	
Sasak	399 (97.32)
Sumbawa	5 (1.22)
Bima	1 (0.24)
Java	3 (0.73)
Bali	0 (0.0)
Others	2 (0.0)

2.1.3 The malaria knowledge according to each construct

There were 8 questions constructed in the questionnaire to determine the level of malaria knowledge. There was an increase in the level of knowledge for each construct before and after intervention (Figure 2.2). There were 6 out of 8 aspects having more than 50% students with correct answers after intervention. These aspects include knowledge on: malaria symptoms, malaria as a dangerous disease, malaria as a transmissible disease malaria vector, vector breeding sites and malaria treatment. This suggests that the malaria comic distributed to children along with storytelling and games method were effective to increase students' knowledge on malaria.

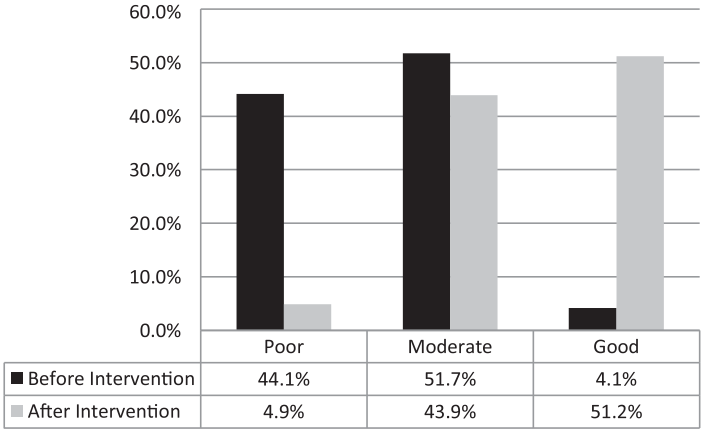


Figure 2.1 Distribution of overall malaria knowledge before and after intervention

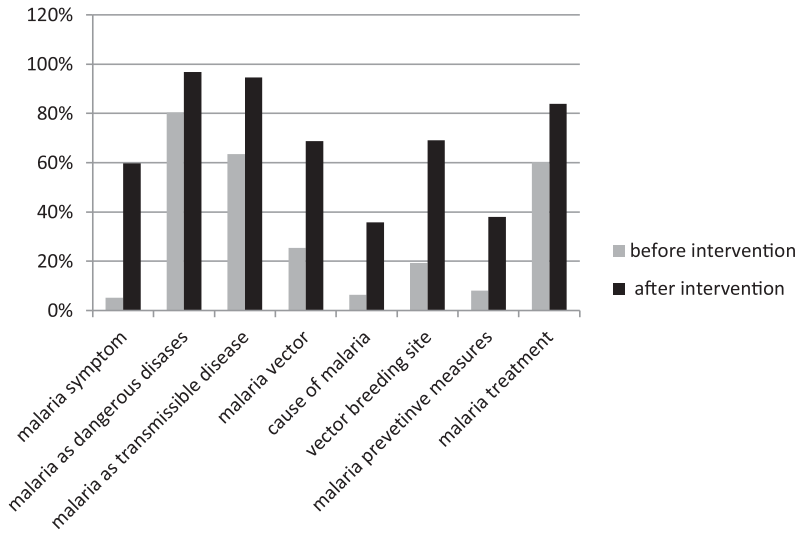


Figure 2.2　Percentage of students categorized “good” malaria knowledge before and after intervention in Batunampar, Tanjung Luar, Sukaraja and Pijot.

Table 2.2　Differences of malaria knowledge according to each construct in Batunampar, Tanjung Luar, Pijot and Sukraja

Knowledge aspects	Before intervention	After intervention	P-Value
Malaria symptom			
Good	21 (5.1)	245 (59.8)	
Poor	389 (94.9)	165 (40.2)	$p<0.001$
Malaria as a dangerous disease			
Good	329 (80.2)	397 (96.8)	
Poor	81 (19.2)	13 (3.2)	$p<0.001$
Malaria as a transmissible disease			
Good	260 (63.4)	388 (94.6)	
Poor	150 (36.6)	22 (5.4)	$p<0.001$
Malaria vector			
Good	104 (25.4)	282 (68.8)	
Poor	306 (74.6)	128 (31.2)	$p<0.001$
Cause of malaria			
Good	26 (6.3)	147 (35.9)	
Poor	384 (93.7)	268 (64.1)	$p<0.001$
Vector breeding site			
Good	79 (19.3)	283 (69.0)	
Poor	331 (80.7)	127 (331.0)	$p<0.001$
Malaria preventive measures			
Good	33 (8.0)	156 (38.0)	
Poor	377 (92.0)	254 (62.0)	$p<0.001$
Malaria treatment			
Good	247 (60.2)	344 (83.9)	
Poor	163 (39.8)	66 (16.1)	$p<0.001$

However, 2 out of 8 aspects, there were less than 50% students with correct answers. These aspects include: cause of malaria and preventive measures on malaria. In regards

ASPECT	N = 410 (%)
Was the intervention method interesting?	
1: Yes	349 (85.1)
2: No	61 (14.9)
Was the comic informative?	
1: Yes	391 (95.4)
2: No	19 (4.6)
What intervention method was most interesting?	
1: Comic	226 (55.1)
2: Storytelling	125 (30.5)
3. Game	59 (14.4)

to the knowledge on the cause of malaria, the expected answer was Plasmodium. Approximately 36% children have the correct answer to this aspect. Despite the fact that the aspect of the cause of malaria was well emphasized in the malaria comic designed by researchers, the concept of Plasmodium or the transmission route to humans via a bite of an infected mosquito might be yet hard for students to fully comprehend.

Regarding preventive measures, students were expected to recall at least 3 preventive measures, only 38% students were able to give 3 answers or more, although various methods of preventive measures have already been described in the malaria comic. It is required to consider providing additional means to enhance students' understanding on preventive measures.

A significant increase of knowledge before and after intervention in all aspects of malaria knowledge ($p < 0.001$) was shown. This would well suggest that intervention method with the comic is effective to increase malaria knowledge among elementary school children. Moreover, this would suggest that the malaria comic is suitable as means of malaria intervention method to several elementary schools in East Lombok. The detailed information is shown in Table 2.2.

2.1.4 Feedback on Method of Intervention

After the intervention, we collected the feedback from the students regarding the overall intervention. The majority of students mentioned that the method was very interesting 349 (85.1%) while only 53 (12%) children found the method "not-bad" and only 8 (2%) children found it "not-interesting at all". Below is a figure to illustrate the above proportion. The majority of students found that the malaria comic was easy to understand and informative 391 (95.4%). Only 19 (4.6%) found the comic hard to understand. The majority of students mentioned that the preferred method was malaria comic (55%) while 31% students enjoyed storytelling and a minority of students (14%) preferred game as a mean of intervention.

2.2 Part II Study: Belanting and Obel-Obel Villages

The results of the Part Study are obtained from the north part of East Lombok,

comprising 2 villages: Belanting and Obel-Obel.

2.2.1 Respondent's Characteristics

A total of 385 elementary school students (5–6 grade) from the 2 villages in the north part of East Lombok participated as respondents in this study, including 243 (63.1%) from Belanting village and 142 (36.9%) from Obel-Obel village. The respondents participated in the preliminary study for a school based malaria intervention using comic as a medium of intervention. A pre- and post-test was conducted to determine the level of malaria knowledge.

In general, sex ratio of respondents in this study is 196 (50.9%) male and 189 (49.1%) female. The age ranges are from 9 to 13 with the majority age of 11 (40.2%). The major religion and ethnic group are Islam (99.7%) and Sasak (98.2%). Comprehensive description of the respondents' characteristics is presented in Table 3.1.

In terms of family characteristics, the majority of respondents have less than 3 siblings, with 23.6% respondents having 1 sibling and 23.1% having 2 siblings. Most of the fathers of school children are employed (97.4%) and their predominant occupation is farmer (58.7%). The majority of mother's occupation is farmer (40.3%) followed by housewife (39.5%). These results show similar results as the baseline data collected through ESMKB AESCEL in the south part of East Lombok, which tells that the both study sites have relatively similar characteristics. A more detailed description of family characteristics is presented in Table 3.2.

The majority of parent's education level is an elementary school graduate. Approximately 32.2% of the father's and 34.5% of the mother's education level were elementary school graduates. There are also a considerable number of respondents'

Table 3.1　Respondents' characteristics

Characteristics	N = 385 (%)
Age	
9	60 (15.6)
10	116 (30.1)
11	123 (31.9)
12	63 (16.4)
13	23 (6.0)
Sex	
Male	196 (50.9)
Female	189 (49.1)
Religion	
Islam	384 (99.7)
Hindu	1 (0.26)
Ethnicity	
Sasak	378 (98.2)
Sumbawa	4 (1.0)
Bali	1 (0.3)
Jawa	2 (0.5)

Table 3.2 Family Characteristics

Characteristics	N = 194 (%)
Number of Siblings	
0	19 (5)
1	91 (23.6)
2	89 (23.1)
3	62 (16.1)
4	50 (13.0)
5	52 (13.5)
＞5	22 (5.7)
Father's occupations	
Government employee	24 (6.2)
Army/Police	3 (0.8)
Teacher	13 (3.4)
Private sector	24 (6.2)
Fisherman	19 (4.9)
Farmer	226 (58.7)
Labor	38 (9.9)
Works overseas	12 (3.1)
Unemployed	10 (2.6)
Others	16 (4.2)
Father's Educations Level	
No Formal Education	55 (14.3)
Uncompleted Elementary School	68 (17.7)
Elementary School Graduate	124 (32.2)
Junior High School Graduate	59 (15.3)
Senior High School Graduate	51 (13.2)
Diploma Graduate	4 (1.0)
College Graduate	24 (6.2)
Mother's Occupation	
Housewife	152 (39.5)
Government employee	4 (1.0)
Teacher	3 (0.8)
Farmer	155 (40.3)
Labor	38 (9.9)
Works overseas	7 (1.8)
Private Sector	17 (4.4)
Others	9 (2.3)
Mother's Education Level	
No Formal Education	74 (19.2)
Uncompleted Elementary School	58 (15.1)
Elementary School Graduate	133 (34.5)
Junior High School Graduate	73 (19.0)
Senior High School Graduate	39 (10.1)
Diploma Graduate	2 (0.5)
College Graduate	6 (1.6)

parents (14.3% of father and 19.2% of mother) without any formal education in their lives. These results show similar results to baseline data of the ESMKB AESCEL conducted in Tanjung Luar, Batunampar, Pijot and Sukaraja in 2012.

2.2.2 Sources of information on malaria

Approximately, 247 (64.16%) respondents have either heard of the term malaria or are familiar with the local term of malaria while 138 (35.8%) respondents are. Among the students who have heard the term malaria or local term of malaria, the major sources of information on malaria were school (43%), television (24%), parents (22%), and others

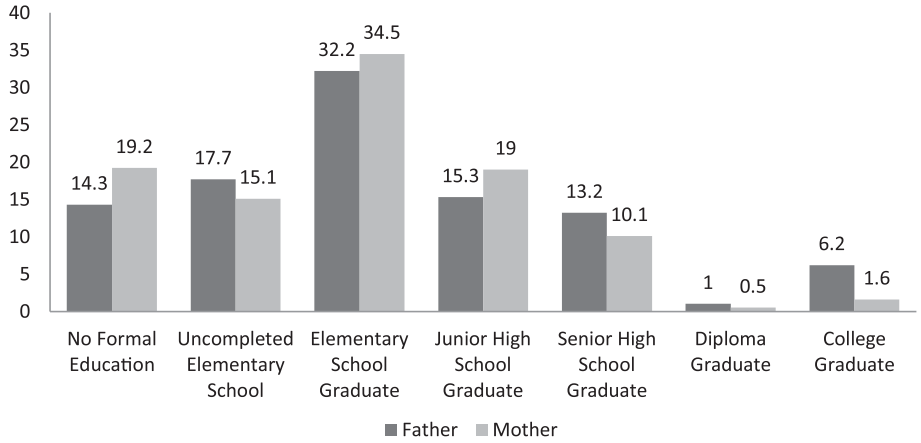


Figure 3.1　Distribution of Parents Formal Education (%)

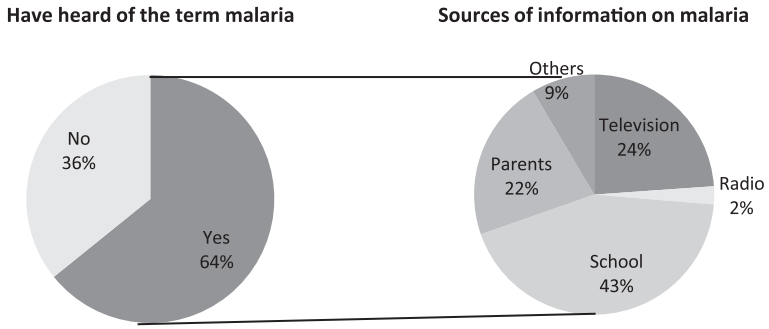


Figure 3.2　Sources of information on Malaria

(9%) as seen in Figure 3.2, which shows similar results to the ESMKB AESCEL study in 2012. Regardless of the fact that any specific curriculum regarding malaria has not yet been established among elementary schools in East Lombok, teachers are acting as one of the information sources of malaria knowledge to students. Mainly, physical education teacher and health care staff from Puskesmas that visits the school once a week play the role. According to the finding in this study, physical education teacher in several schools have initiated to give brief information on malaria to school children. However, increase of teacher's capacity on malaria knowledge should be expanded for adequate education, so that children will be well equipped to play a significant role as Health Messengers optimizing the transfer of malaria knowledge to their families and friends.

The results also show that parents are one of the most predominant sources regarding malaria information. It could be implied that parents, particularly mothers, may have a key agenda to evoke further awareness of malaria knowledge and prevention. Television is unable to disregard as a source of information for children, and knowledge on malaria is no exception.

2.2.3 The susceptible behaviors and anti-mosquito utilization related to malaria among children

An outdoor activity at night is commonly identified as high risk malaria behavior. This study reveals 80.9% of children answered “frequently do outdoor activities at night”. The most common outdoor activities at night is going to the mosque to learn Quran (89%). Among the children who did the frequent outdoor activity at night (N = 306), 42% used anti-mosquito goods and a proportion of 58% do not use any anti-mosquito goods during outdoor activity at night. The 3 most common anti-mosquito preventions frequently used by children are protective anti-mosquito lotion (41%), protective clothing (32%), and anti-mosquito coil (27%). Further details are described in Table 3.3.

2.2.4 Utilization of measures and products by family

The majority of school children answered that they use anti-mosquito measures and products very commonly in the family. At least 84% have some form of anti-mosquito products kept at home. The majority of household had at least 1 type of anti-mosquito products (57%) followed by 2 different types of anti-malaria product utilized at home (17%). Approximately 76% respondents have their own bed net at home.

There were approximately 53% of school children who regard their mothers as persons serving in the predominant role of preparing anti-mosquito product utilization among family members. This would suggest that mothers would be capable to play a significant role in malaria prevention activities and to prevent other diseases transmitted by mosquito around their houses. A more detailed description regarding anti-mosquito products utilization of malaria in the 2 villages are described in Figure 3.3.

Table 3.3 Susceptible behavior and anti-mosquito utilization during outdoor activities at night among children

Malaria Experience	Frequency (%)
Any frequent outdoor activities at night (N = 385)	
Yes	306 (79.5)
No	79 (20.5)
Type of outdoor activities at night (N = 306)	
Learning Quran at the mosque	273 (89)
Playing outdoor	15 (5)
Sitting in Berugak/traditional gazebo	5 (2)
Studying in open spaces	8 (3)
Others	5 (2)
Usage of anti-mosquito goods during outdoor activities at night (N = 306)	
Yes	130 (42)
No	176 (58)
Different type of anti-mosquito utilization (N = 130)	
Anti-mosquito coil	35 (27)
Anti-mosquito lotion	53 (41)
Protective clothing	42 (32)

Table 3.4　Malaria prevention practices in the respondent's family

Behaviors	Frequency (%)
Use of anti-mosquito products in the house (N = 385)	
Yes	323 (84)
No	62 (16)
Number of anti-mosquito products utilized (N = 385)	
None	62 (16)
1 type	219 (57)
2 types	66 (17)
3 types	26 (7)
4 types	4 (1)
＞4 types	8 (2)
Utilization of bed net in the house (N = 385)	
Yes	292 (76)
No	93 (24)

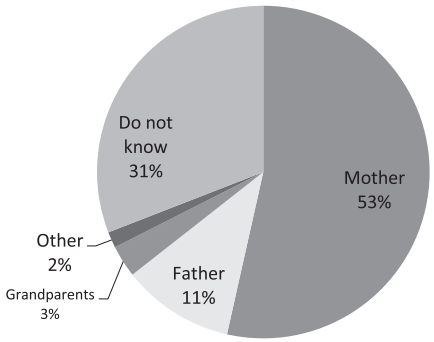


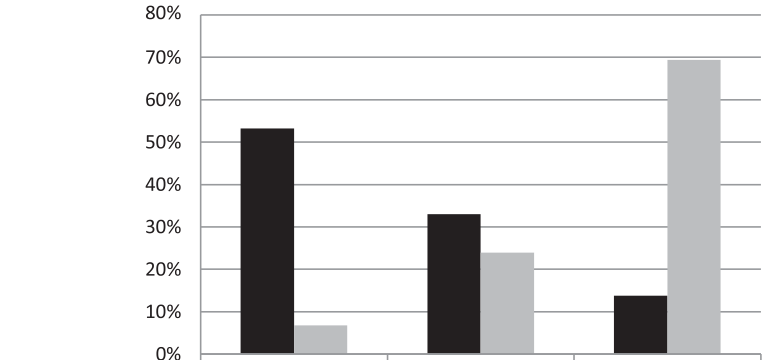
Figure 3.3　Family members responsible in preparing anti-mosquito products around the house

2.2.5 Malaria Knowledge

As shown in Figure 3.4, there is an increase of level of malaria knowledge after the intervention. Before the intervention, there were only 14% students having good level knowledge on malaria. After the intervention with the comic, story telling and games, the percentage of students with good level of malaria knowledge increased to 69%.

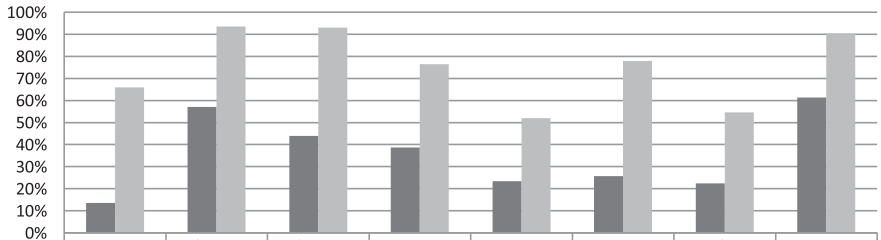
Furthermore, regarding the 8 constructs that build the knowledge on malaria in this study, there are several interesting findings (as seen in figure 3.4 and table 3.5): After the intervention, the aspects that had a sufficient increase of knowledge (more than 60% students were able to identify the correct answer) were: on malaria symptoms, malaria as a dangerous disease, malaria as a transmissible disease, vector of malaria, malaria vector breeding sites, and malaria treatment. Thus, this study suggests that the comic transferred the knowledge regarding the above aspects sufficiently. However, the aspects that had less sufficient results (less than 60% students were able to identify the correct answers) were: the causes of malaria, and malaria preventive measures.

Regarding preventive measures, the students were expected to have sufficient



	Poor	Moderat	Good
Before intervention	53%	33%	14%
After intervention	7%	24%	69%

Figure 3.4　Overall level of malaria knowledge



	malaria symptom	malaria as a dangerous disease	malaria as a transmissible diseae	malaria vector	cause of malaria	vector breeding site	malaria preventive mesaure	malaria treatment
Before intervention	14%	57%	44%	39%	23%	26%	22%	61%
After intervention	66%	94%	93%	76%	52%	78%	55%	90%

Figure 3.5　Malaria knowledge before and after the intervention based on each construct

understanding of the 3 preventive measure aspects: human behavior modification, environmental management and vector control. Only 55% students were able to identify at least 2 preventive measures correctly after the intervention. This suggests that further revision method emphasizing on malaria preventive measures should be conducted for children's sufficient grasp of malaria prevention. The cause of malaria was also the aspect which the students showed one of the lowest levels of knowledge even after the intervention. Only 52% students were able to provide the correct answer. The majority of students were unable to distinguish between mosquito as the vector and Plasmodium as the infectious agent, which might yet be rather hard for children at their age to have full comprehension.

Moreover, there was a significant increase of knowledge in all aspects of malaria knowledge before and after intervention ($p < 0.001$). This suggests that intervention method with the comic is effective to increase malaria knowledge among elementary school children. Moreover, the malaria comic is suitable as means of malaria intervention

Table 3.5　Differences of malaria knowledge in each aspect in Belanting and Obel-Obel

Knowledge aspects	Before intervention	After intervention	P-Value
Malaria symptom			
Good	52 (13.5)	254 (66)	
Poor	333 (86.5)	131 (34)	$p<0.001$
Malaria as a dangerous disease			
Good	220 (57.1)	360 (93.5)	
Poor	165 (42.9)	25 (6.5)	$p<0.001$
Malaria as a transmissible disease			
Good	170 (44.2)	358 (93)	
Poor	215 (55.8)	27 (7)	$p<0.001$
Malaria vector			
Good	149 (38.7)	294 (76.4)	
Poor	236 (61.3)	91 (23.6)	$p<0.001$
Cause of malaria			
Good	90 (23.4)	200 (51.9)	
Poor	295 (76.6)	185 (48.1)	$p<0.001$
Vector breeding site			
Good	99 (25.8)	300 (77.9)	
Poor	286 (74.2)	85 (22.1)	$p<0.001$
Malaria preventive measures			
Good	86 (22.3)	210 (54.5)	
Poor	299 (77.7)	175 (45.5)	$p<0.001$
Malaria treatment			
Good	236 (61.3)	347 (90.1)	
Poor	149 (38.7)	38 (9.9)	$p<0.001$

Table 3.6　Students' perception of intervention method in Belanting and Obel-Obel

ASPECT	N = 385 (%)
Was the intervention method interesting?	
1: Yes	276 (71.7)
2: No	109 (31.3)
Was the comic informative?	
1: Yes	346 (89.9)
2: No	39 (10.1)
What intervention method was most interesting?	
1: Comic	221 (57.4)
2: Storytelling	106 (27.5)
3. Games	58 (15.1)

method to several elementary schools in East Lombok.

2.2.6 Feedback on Method of Intervention

After the intervention, a survey was conducted to seek respondents' feedback on the intervention method (Figure 3.7.1 and table 3.7.1). According to the survey, the majority of students (71.1%) found that the overall intervention method was interesting. Moreover, most of the students (89.9%) mentioned that the comic was informative and easy to understand. And among the 3 intervention methods, the comic was the most popular (57.4%).

3. Conclusion

A total of 795 students participated in this study. As many as 410 were elementary school children from the south part of East Lombok, namely, Tanjung Luar, Batunampar, Pijot and Sukaraja Village (Part I Study) while 385 students were from the north part of East Lombok, namely, Belanting and Obel-Obel Village (Part II Study). According to this study, both areas have similar characteristics. The majority of ethnic was Sasak. Regarding family characteristics, the Study of Part I and II shows similarity (family characteristic of respondents in the south part of East Lombok as shown in the ESMKB AESCEL study in 2012). The vast majority of parent's education level is elementary school (completed or not completed) or no formal education. The major occupation of father is a farmer. These results are similar to those in the CBDESS study conducted in 2007.

We also find the similar results in regard to susceptible behaviors and anti-mosquito utilization. The majority of children perform outdoor activity at night, mainly learning Quran in the mosque, which are commonly known as high risk malaria behavior. However, the use of anti-malaria goods during outdoor activities at night among children in Belanting and Obel Obel is 42%, which is lower compared to the condition in Tanjung Luar, Sukaraja, Batunampar and Pijot (60.9%). Since Belanting and Obel-Obel are known to have a higher rate of malaria compared to the villages in the south part of East Lombok, the susceptible behaviors are definitely a potential threat to children.

Mothers have shown to have a major role in initiating the preparation and utilization of anti-mosquito goods as seen consistently in the Study of Part I (56%) and Part II (53%). High utilization of anti-mosquito goods in the household was shown in both studies, representing more than 80% of the total. These results are also linear with previous CBDESS study in 2007, where the usage of anti-mosquito goods represented 77.3%.

School based Malaria Intervention method conducted in this study was in the form of originally designed comic, combined with storytelling and games. This study shows a significant increase on malaria knowledge before and after intervention among elementary school children in the north part and the south part of East Lombok ($p < 0.001$). Moreover, the majority of students mentioned the overall method of intervention was interesting, informative and easy to understand. As there were similar findings between the two studies, it would imply that the means of intervention through comic designed by the researchers is a method that is considered to be preferable and suitable for the children in East Lombok.

Despite these satisfying results, renewed efforts are required for a sustainable school

based malaria intervention method. Now, the development of enhanced learning brochure for teachers is imperative. It will generate the synergy between the malaria comic developed in this study and to become an innovative means of teaching and learning malaria among elementary schools in East Lombok. Long term follow-up actions must be conducted in order to maintain the school children's malaria knowledge level that was obtained through the intervention in this study and to encourage the changes in their behavior toward malaria, which will reinforce the long lasting effect of this study.

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